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SEWAGE DISPOSAL PLANT

IN OCEAN GROVE, N. J.

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CLYDE POTTS, ASSOC. M. AM. SOC. C. E.

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One of the Sewage Tanks at Ocean Grove du ing Construction

SEWAGE DISPOSAL PLANT
OCEAN GROVE, N. J.

By Clyde Potts, Assoc. M. Am. Soc. C. E.

Early in 1908 the State Board of Health notified the various summer resorts on the New Jersey coast to cease emptying crude sewage into the waters under its jurisdiction. Disposal by dilution was the method commonly used, and the sewage, in nearly every instance, was carried to sea through iron pipe laid on the bed of the ocean and extending out from shore 1,000 to 1,500 ft. In consequence, the bathing along the coast was not at all times what it should have been, for an easterly wind was apt to return objectionable matter to the beaches. The writer was employed by Ocean Grove to prepare plans and present the same to the State Board for its approval. It was assumed that the protection of the bathing beaches from the aesthetic point of view was all that could reasonably be expected at that time. The order of the State Board of Health did not require the treatment of the sewage along any specific lines nor did it give an index as to what treatments would meet with approval.

The bathing season at Ocean Grove is limited practically to the months of June, July, August and September. The bulk of the summer population is also there during that period, so that the problem was more particularly one of keeping the beaches free from objectionable matter during those months.

Before the installation of sewage tanks Ocean Grove had disposed of its sewage through a 12-in. wrought-iron pipe extending 1,300 ft. beyond high-water mark. It was believed that tanks capable of liquifying the sewage during the four months of the year above mentioned and disposing of the liquified effluent through the outfall already in existence would give satisfactory results. This effluent would discharge into deep water several hundred feet beyond the end of the fishing pier and some hundred feet from the bathing ground so that the possibility of its return would be re-

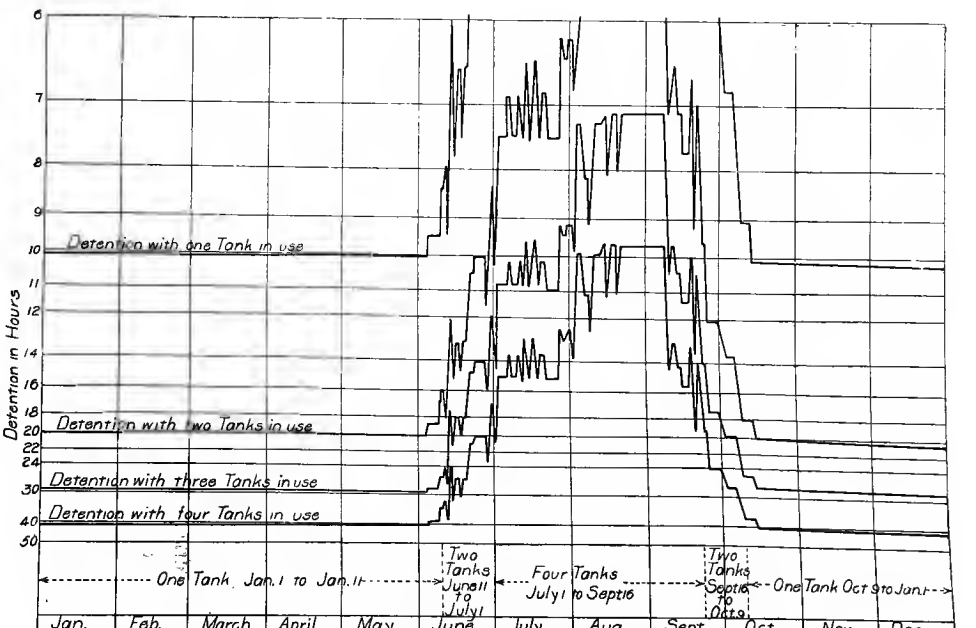


Diagram Showing Detention Periods and Scheme of Operation of Tanks

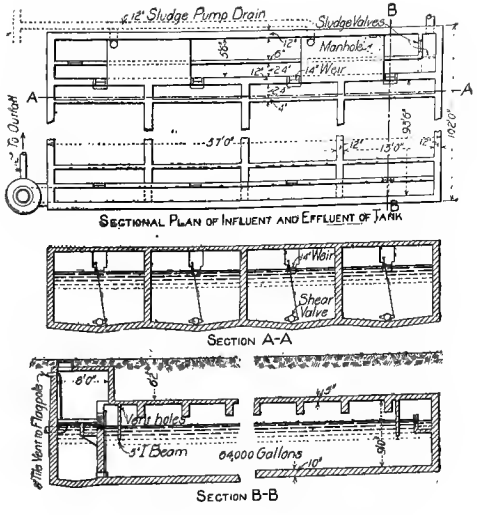
mote. The effluent would already have been broken down in the liquifying tanks and mixed, as it would be, with a large volume of salt water, any harm from its return in this liquified and diluted state would be problematic. Owing to the shortness of the summer season the question of operating the tanks as septic tanks received little consideration.

The sewers of Ocean Grove converge in two lines to the outfall at Embury Avenue. These two sewers are known as the Broadway sewer and the Embury Avenue sewer; the former carries about one-seventh and the latter about six-sevenths of the sewage of the Grove. The depth below the boardwalk at which the sewers discharge into the outfall is 13.1 ft. for the Broadway sewer and only 9.4 ft. for the Embury Avenue line.

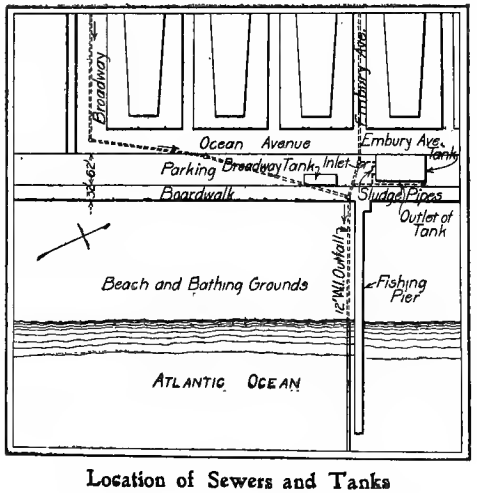
It was early decided to avoid pumping if possible. The liquefying tanks were to be built into the outfall and the sewage allowed to flow in and out by gravity. The problem arose as to the advisability of building separate tanks for each sewer or one tank, large enough to treat the sewage of both, and located at the level required by the Broadway sewer. This would call for building the Embury Avenue tank in which six-sevenths of the sewage would be treated nearly 4 ft. lower than the occasion required, so that it was decided to construct two tanks, one for the Broadway and one for the Embury Avenue sewage, the latter to be generally 3.7 ft. higher than the former, and six times as large. The tanks were built alongside the boardwalk and between it and Ocean Avenue. The lowest point of the Broadway tank was 22 ft. below the boardwalk or about 6 ft. below low tide. The lowest point of the Embury Avenue tank was 18 ft. below the boardwalk or 2 ft. below low tide. It was this depth in the sandy beach separated from the ocean by only the 32 ft. boardwalk that constituted the main problem of the construction.

The sewage flow at Ocean Grove during the summer season approaches a maximum of about 1,200,000 gal. per day, while the winter consumption is only about 300,000 gal. This variation in the flow was another problem that entered, to a considerable extent, in any scheme adopted. This variation is shown in the accompanying diagram.

The Embury Avenue tank has a total capacity of 260,000 gal.



Details of Embury Avenue Tank



Location of Sewers and Tanks

and is divided into four compartments as shown in the accompanying drawing. The curves in the diagram above mentioned show graphically the detention in hours of the sewage in the Embury Avenue tank. It was thought that with tanks of sufficient size to give a minimum detention of 10 hours the desired results would be accomplished. Reference to the diagram shows that with one of the four sections in operation the detention will be about ten hours from Oct. 9 to June 11. From June 11 to July 1, two sections would be required to give 10-hours' detention and from July 1 to Sept. 16, during the busiest season, the entire four sections would be needed. From Sept. 16 to Oct. 9, two sections could be used. These curves are based on the water consumption, with an allowance for infiltration, during the years 1906-1908.

The larger tank is of reinforced concrete throughout, and is provided with a small detritus chamber, 5½ ft. wide and 57 ft. long, extending across the end of the four compartments, which make up the settling tank. These four compartments are equal in size and are 9½ ft. long by 13 ft. wide, with an average depth of 7 ft. They are so arranged that the sewage passes "in parallel" through any one or all of them, thus enabling the time of detention to be controlled by the number of compartments in use. The sewage may or may not flow through the detritus chamber, entrance to the same being controlled by valves. Sludge or detritus accumulations in either compartment of the tank or detritus accumulations in either compartment of the tank or detritus chamber may be pumped to sea through the 12-in. sludge pipe. Portable pumps driven by electricity are to be used for this purpose and operating floors are located over the detritus chamber. A sump leading to the sludge drain has an opening in each of these contrete floors into which the discharge of the pump may empty. The space over the detritus chamber is housed in so as give plenty of room for the operation of the pumps and at the same time furnishes plenty of room for the operation of the valves which control the flow into the different sections of the tank. This operating chamber is 57 ft. long, 8 ft. wide and 6 ft. high. If the sewage should ever require a higher degree of purification than at present comtemplated it is intended to use this chamber for disinfecting. The photograph shows the tank while the roof was being placed, and also the proximity to the

boardwalk. Both tanks are ventilated through a flagpole set in the ground beside them.

The contract price for the larger or Embury Avenue tank was $15,000, and the Broadway tank, $5,400. J. W. Heller, of Newark, was the contractor. In all, 68,000 lb. of plain steel bars were used in the construction and 1,000 bbl. of Giant cement.

With the exception of the concrete girders in the roof, the tanks were built entirely of gravel obtained near the bathing beaches; on favorable occasions it was recovered by teams and drag scrapers sent out into the shallow water at low tide. The mixture used was 1 : 2 : 4. The girders were built of crushed stone concrete of the same mixture. Corrugated-steel sheeting ⅛-in. thick, of the Wemlinger type, was used, and it is doubtful, owing to the excessive depth and close proximity to the ocean, if the work could have been accomplished without a mishap with the use of ordinary wooden sheeting. One 6-in. centrifugal pump operated at intervals easily kept down the water which entered only from the bottom. Beach sand was practically the only material encountered. An interesting feature lay in the fact that all the water pumped from the excavation was fresh water. Work was begun Feb. 26, and the sewage turned into the tanks July 3, 1909.

An analysis was made of a composite sample of the effluent from the two tanks on Sept. 2, by Mr. F. E. Daniels, under the direction of Mr. H. M. Herbert, chief of the bureau of sewerage and water of the State Board of Health, as follows: Total solids, 814; fixed solids, 659; volatile solids, 155; solids in solution, 752; fixed solids in solution, 625; volatile solids in solution, 127; solids in suspension, 62; fixed solids in suspension, 34; volatile solids in suspension, 28.